DOCUMENT RESUME

ED 465 590 SE 066 288

AUTHOR	DiRanna, Kathy; Loucks-Horsley, Susan
TITLE	Designing Programs for Teacher Leaders: The Case of the California Science Implementation Network.
PUB DATE	2001-00-00
NOTE	25p.; In: Developing Teacher Leaders: Professional Development in Science and Mathematics; see ED 451 031.
AVAILABLE FROM	ERIC Clearinghouse for Science, Mathematics, and Environmental Education, 1929 Kenny Road, Suite 200, Columbus, OH 43210-1080. Tel: 800-276-0462 (Toll Free); Fax: 614-292-0263; Web site: http://www.ericse.org.
PUB TYPE	Reports - Research (143)
EDRS PRICE	MF01/PC01 Plus Postage.
DESCRIPTORS	Elementary Secondary Education; *Faculty Development; Science Instruction; *Science Teachers; Teacher Improvement; *Teacher Leadership
IDENTIFIERS	*California

ABSTRACT

Teacher leadership development programs require careful design if they are to meet the challenges of today's science and mathematics education reform initiatives. This chapter describes the design of one such program using a design framework developed to plan and analyze effective professional development programs. The program, the California Science Implementation Network (CSIN), develops teacher leaders to assist their schools and others to improve the quality of their science programs. CSIN's context, the knowledge and beliefs that influenced their design, the strategies they use, and the issues they face, are discussed in detail in the chapter. A vignette of a school district participating in CSIN illustrates how teacher leadership grows and functions in one setting. (Contains 13 references.) (Author/MVL)

Reproductions supplied by EDRS are the best that can be made
from the original document.

ED 465 590

5 Designing Programs for Teacher Leaders: The Case of the California Science Implementation Network

Kathy DiRanna &
Susan Loucks-Horsley
National Research Council
Center for Science, Mathematics and Engineering

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)
☐ This document has been reproduced as received from the person or organization originating it.
☐ Minor changes have been made to improve reproduction quality.
• Points of view or opinions stated in this document do not necessarily represent official OERI position or policy.

Teacher leadership development programs require careful design if they are to meet the challenges of today's science and mathematics education reform initiatives. This chapter describes the design of one such program using a design framework developed to plan and analyze effective professional development programs. The program, the California Science Implementation Network (CSIN) develops teacher leaders to assist their schools and others to improve the quality of their science programs. CSIN's context, the knowledge and beliefs that influenced their design, the strategies they use, and the issues they face, are discussed in detail in the chapter. A vignette of a school district participating in CSIN illustrates how teacher leadership grows and functions in one setting.

Programs for teacher leaders face an enormous challenge. Although these programs work hard to support the development of new knowledge, skills, and dispositions for teachers taking on roles as leaders, they must simultaneously attend to issues of classroom teaching, of school and district development, and of policy implementation. Thus, designing programs for teacher leaders is somewhat more complicated than doing so for teachers—and it often occurs under enormous pressure to transform teaching and learning and do so with backbreaking timelines. Without teachers taking on leadership roles, helping increasingly more teachers to grow and change, there is no hope that our current reforms will achieve their ambitious goal: strong science and mathematics learning for *all* young people.

It is in this context that an ambitious teacher leadership initiative began in California, and has grown and been sustained for over a decade. This chapter describes the California Science Implementation

SE 066 288

BEST COPY AVAILABLE

Network (CSIN), a professional network that has evolved from its focus on elementary school science to extending across the curriculum and into a partnership with other programs that now stretches across K-12 as the California K-12 Alliance. The story of CSIN and its work in teacher leadership is told here by its current director and its one-time formative evaluator—a partnership through which both of us have learned a great amount over time. Here we use a framework developed by the National Institute for Science Education (Loucks-Horsley, Hewson, Love, & Stiles, 1998) to describe and analyze CSIN's design for leadership development, to point out unique features of the design that appear to contribute to the network's success and issues with which we both continue to struggle. We have chosen to use the first person in this chapter, for it emphasizes the life and dynamism of the network. However, the voice is that of CSIN's professional developers,[1] with their evaluator in the less active role of "participant observer." Who benefits most directly from CSIN's teacher leadership program? Before we describe CSIN's design for developing teacher leaders, we introduce four of them.

The Power of One!

Ten years ago, four teachers left their classrooms and schools to attend a science education leadership development program sponsored by CSIN. The goal of the program was to develop teacher leaders who could assist their schools in designing and implementing quality science programs. The four teachers had a variety of backgrounds, but all enjoyed science and wanted their students to have interesting, engaging, and challenging science experiences.

Kim was a quiet, experienced teacher, in the same district for over 20 years. She cared about her students and worked hard at preparing a positive, academic curriculum. Kim had never been a leader in her school or district, but was respected by her colleagues as a competent teacher. When the district was ready to improve science, Kim was selected as a lead teacher from her school to join teachers from four other schools at the science leadership training. When she arrived, she was overwhelmed at the quality of participants.

They knew much more science than she, seemed much more articulate, much more "together." She never really viewed herself as a

---

[1]The authors appreciate the contributions of CSIN staff members Cindy Anderson, Karen Cerwin, Diane Dooley, and Phil Lafontaine.

leader. The leadership program, however, required Kim to build on her strengths and partnered her with others to address her shortcomings. Kim found a place to learn, to grow, and to spread her wings. She returned to the network for several more years. She took on increasingly complex tasks in the professional development program, designing and delivering many sessions. Yet, something was lacking: over the years, she had difficulty bringing others along and eventually, her district officially dropped from the program. District administrators and her colleagues still view Kim as competent and have continued to ask her to conduct science workshops and serve on district committees to decide policy issues.

Jose, like Kim, was an excellent teacher. He was a science specialist at his school and everyone was thrilled to have him on staff. He was enthusiastic and an example of a "life-long learner." He attended the leadership development program for several years and assumed the role of a staff developer to work with several schools. The catch—none of these schools were from his district. He was not perceived as a "prophet in his own land" and try as he may, he was only able to move his own school forward. Jose looked for other ways to use his knowledge of science and his leadership skills. He became interested in statewide assessment through his work with CSIN and is now working with an assessment project to develop assessments and train people in their use nationwide.

Teaching science in the middle grades was Gail's love. She was good at it and had the support of parents, colleagues, administrators, and students. The school sent her to be their representative at the California Science Project (CSP). CSP collaborated with CSIN for all of their leadership training. Gail came with the skills of an excellent teacher, but no idea how to work with adults, design professional development, change schools, etc. The network leadership program developed these skills. As a staff developer she had to design professional development sessions that addressed content as a "conceptual flow" and inquiry as a reflection of questioning strategies, and use a questionnaire assessing teachers concerns to determine appropriate interventions. Then Gail had to conduct these sessions at a lead teacher institute. And she came back year after year to refine these skills, gain new insights, and address new challenges. Gail now directs a regional professional development program for K-12 teachers built on the principles she learned in the network. Yet science at her district is still uneven.

Brad taught in a medium-sized suburban district in Los Angeles County. In 1988, he volunteered to participate in CSIN based on his interest in improving science instruction in his 4th grade classroom. Little did he know that his participation in the network would lead to opportunities far beyond the classroom. Through CSIN professional development opportunities, Brad was able to choose leadership paths within his school and district, region, and within the state. On his leadership journey, Brad assumed a number of roles from lead teacher, to staff developer, and a cadre member. In these roles, Brad not only delivered the work of the network but also provided essential feedback to the organization, informing many of the practices and decisions of the network. Brad's district realized the importance of his work and eventually created a new position at the district level that included responsibility for all science programs and science professional development. Over a ten-year period, the district has institutionalized inquiry-based science in all of its schools and has an ongoing professional development program to support science.

What is Leadership?

Of the four teachers profiled above, who is the teacher leader? By our definition, they all are. These four teachers share several things in common: they had a desire to take action on something they cared about; they were empowered at some level to make change; and they have the knowledge, skills, and stamina to lead. These three themes occur and re-occur when one looks at successful leadership. Kim had a personal transformation and was able to share information with others. Jose spread a "thousand points of light" that caused others to think and re-think the impact of their science program on student achievement. Gail came as one teacher and influenced an entire region. Brad led the institutionalization of a district for inquiry-based science.

Our certainty from many leadership development experiences that leadership is key to reform is validated over and over again in the research on professional development and educational change. Michael Fullan (1991) and Rodger Bybee (1993) point out that leadership and support are required for professional development experiences to be actualized as changes in teaching and learning. But what is leadership? What does it mean to be a teacher leader? We recognize that leadership means different things to different teachers. Some teachers embrace it, while others avoid it at all cost. Few seem neutral to the concept. If we believe that developing teacher leadership

builds capacity, then we as leaders of reform must understand how leadership is viewed and how our constituents define it.

David McClelland (1970) suggests that people are driven to leadership by at least one of the following motives: (1) achievement—the desire to complete tasks and accomplish goals; (2) affiliation—the desire to be liked and to share in positive relations; and (3) power—the desire to exert influence. Many educators—particularly teachers—can identify with the first two and shy away from the last motive. In large part this is due to our negative stereotypes of power that have led us to equate it with being a bully, with dominance, and with arrogance. Yet McClelland reminds us of another face to power—that of empowerment. Harvey and Drolet (1994) suggest that the most effective approach to leadership focuses on others and emphasizes the growing competence of everyone in the organization. "Empowerment is the art of increasing the competence and capability of others by endowing them with a sense of self-worth and potency" (p. 163).

Julian Weisglass, (1994) a mathematics professor at the University of California, Santa Barbara, eloquently describes leadership as "taking responsibility (action) for something you care about" (p.1). This may or may not be done on a large scale; its impact may be huge, or minimal; it may be complex or deceivingly simple. No matter. When the action is something near to your heart and soul, the action has a chance of succeeding. When you are responsible for something you don't care about, the work at best is half-hearted and at worst is reckless, a waste of time and establishes a downward spiral for the intervention.

What are the characteristics of effective leadership?

Information is power, Margaret Wheatley. Our view of leadership is broader than many other views because we recognize that being a good teacher is not the same thing as being a good leader and working with adults is not the same as working with students. Certainly, we need teacher leaders who are knowledgeable about science content, instructional strategies, and student achievement. But it goes further. A teacher leader must facilitate change with their colleagues through their roles as trainers, coaches and consultants. Additionally, teacher leaders must develop expertise in organization design, change theory, adult learning, management skills, decision making, public relations and handholding. Change is, after all, a people business.

A leader is a dealer in hope, Napoleon Bonaparte. Characteristics such as having vision, being persistent, having a sense of humor, and welcoming diversity enable leaders to radiate the possible. Leaders who are knowledgeable and have practical experience are credible. And credibility lends itself to confidence. Leaders with both traits move people. A leader driven by passion will succeed in expanding energy to get the job done. A leader's vision must be vital, exciting, and clear. And it must communicate the "I can" (of course with support!) philosophy. Leaders who sense opportunity rather than danger, empower rather than control, and develop rather than maintain, enable people and organizations to pursue their dreams.

To lead people, walk behind them, Lao-Tzu. Although leaders are often recognized for being in front, true leaders know how to support from behind. These leaders balance guidance with independence, vision with reality, leading with following, authority with shared decision-making, "stardom" with partnerships. Effective leaders are committed to the community. They recognize that no one person can do this by him or herself.

Leaders must be stewards, both for the people they lead and for a larger purpose that benefits all, Senge (1990) Stewardship is also a trait that is common among successful leaders. They see the need to give back to the system—to nurture and mentor the budding leaders and to provide support for their learned colleagues. They develop or participate in networks to share ideas, successes, and challenges. They see the need for collaboration and recognize that there is much more to do than any one person could accomplish. On a daily basis, they live the idea that the whole is greater than the sum of its parts.

Why is Leadership Development Necessary?

Leaders aren't born—they are made. And they are made like anything else through hard work—Vince Lombardi.

We believe in a continuum model of leadership—not levels of leadership. Thus, you do not graduate to be a leader. Instead, you move along a pathway building knowledge, skills, and understanding because you are grounded in leadership practice in your daily life. And because leadership is a continuum, everyone can be a leader in some capacity. Everyone has some sphere of influence in which they can effect change. But they need to learn how to do it and they need support.

Building capacity does not just happen. It is the result of carefully designed professional development programs, divine providence, and just plain luck! As Karen Worth (in Loucks-Horsley et al., 1998) notes, "you plan for where you want to go and then meander towards it" (p. 248). But what do you consider as you plan an initiative, in particular, the development of responsive, empowering leaders?

Designing Programs for Developing Leaders

A framework for design can help think about development programs: those for leaders as well as those for teachers. Several years ago, the professional development team of the National Institute for Science Education (NISE) set out to research effective professional development for teachers of science and mathematics. Collaborating with experienced and well respected professional developers from all over the country, we soon discarded our search for successful models, realizing that, like effective teaching, effective staff development is an ongoing and ever-changing process of design. Good professional developers, like good teachers, begin with a set of goals based on the needs of teachers and the students they teach; consider the particular constraints and resources of the educational context, and draw on knowledge and strategies from research and best practice to create the most responsive, and consequently unique, program or initiative for the particular setting. A design framework, depicted in Figure 1, illustrates the parts of the design process and the elements that warrant consideration if the design is to be successful (Loucks-Horsley et al., 1998).

The design framework can be used in several ways (Mundry & Loucks-Horsley, 1999). It can be used to guide actual design of programs and initiatives, to analyze and then improve existing programs and initiatives, and to understand why and how a program failed or succeeded. Also it can be used as an analytic tool after the program has ended to describe a program and how it seeks to pay attention to all of the processes and elements of design. It is this last way that we use the framework in this article: we describe how leadership is developed by CSIN to pursue its mission to assist districts, schools, and teachers to transform the education of their students. CSIN's leadership development program is an example of a robust, broadly reaching initiative whose design pays careful attention to the many elements needed for professional learning and change. In the sections below, we describe this leadership development

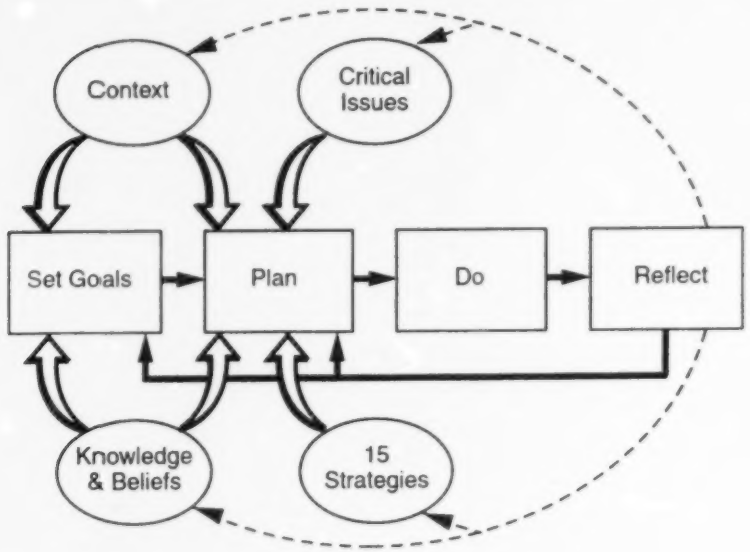

Figure 1. Design Framework

program using the elements of the professional development design framework.

Context

Context is a key influence in the design of professional or leadership development initiatives. Expectations set by states, districts, schools, and communities; the nature of the student and teacher population; the human and financial resources available to education; these and many more factors affect the goals and strategies used in the design. In the case of CSIN, the state context was critical because it set important expectations for teaching and, consequently, for the roles of leadership.

In the early 1980s, California began major educational reform in all curricular areas. By the early 1990s, California had put a model of systemic reform into place that included: 1) curriculum frameworks which formed the foundation for reform; 2) state-adopted instructional resources based on the philosophy of the frameworks; 3) statewide "authentic" assessment aligned with the content and pedagogy of the frameworks; 4) program quality reviews for a school's self study

of the effectiveness of their mathematics and science programs; and 5) statewide leadership development networks in mathematics and science.

California applied for and was awarded a National Science Foundation (NSF) statewide systemic initiative grant in 1992. The California Alliance for Mathematics and Science (CAMS) had professional development as a major strategy for systemic reform. The plan built on two prototype teacher networks and expanded them statewide. These networks, the Mathematics Renaissance and CSIN were school based, designed to create a capacity at the school level to implement the reform. The networks were strategically targeted at grade spans that acted as "gatekeepers, rather than gateways" for all students. Thus Mathematics Renaissance focused on middle school mathematics reform, while CSIN addressed reform for K-6 science. Because of California's size (e.g. 6,500 elementary schools), direct professional development for all teachers was not feasible. Instead, each network worked with a "tip-point" strategy that assumed that by involving 20-30% of the state's schools in the reform, the scale would "tip" and the other schools would follow suit in pursuing the reform agenda. As part of this strategy, the networks developed teacher leaders who, in addition to working with their schools or clusters of schools, became members of committees, in which statewide policies were made.

CSIN actually began in 1988, prior to the NSF funding, as a fledging teacher leader network with one statewide director, 25 teacher trainers (science staff developers) and 50 schools. Over its 11-year history, CSIN (with NSF funding) grew to 12 regional directors and over 200 staff developers (classroom teachers who work with multiple schools). In the process, CSIN has assisted more than 1700 elementary schools to plan and implement quality science programs, and it has influenced how schools operate—from finances to teacher collaboration to student learning. CSIN has helped develop the leadership capabilities of more than 2000 teacher leaders.

CSIN has recently joined with two other reform initiatives to form the K-12 Alliance (California Science Implementation Network [CSIN], Science partnerships for Articulation and Networking [SPAN], Scope, Sequence and Coordination [SS&C]). The Alliance follows the CSIN model as it builds a school's capacity for initiating and implementing change in science programs through a 21-day year-round professional development program that focuses on content, use

of instructional materials, pedagogy, and leadership. A school may enroll yearly, but schools are encouraged to participate for three to five years. (Evaluation indicates that a three-year involvement increases the likelihood that change will occur and be sustained.) The program is designed and continuously reviewed and refined, based on local needs and impact data from the participants and their students. The development of school capacity and the leadership required to maintain it is based on knowledge and a set of beliefs that combines the "wisdom of practice" and research findings related to leadership, pedagogy, science content, and the change process. This knowledge base influences how teachers are nurtured to be leaders, through appropriate and varied strategies for learning and leadership development. The design is juxtaposed against a number of critical issues that staff have determined need to be attended to if an initiative is to succeed.

Knowledge and Beliefs about Leadership

We are a society that operates from knowledge and beliefs—whether it be the type of car we drive, the politics we support, the jobs we continue to do and the causes for which we volunteer. Our actions within the educational system are no different. Our view of professional development—from the amount of time we devote to the effort, to the impact we try to have—is guided by what we know, what we understand, and what we believe. Knowledge and beliefs are a critical component of the design framework and influence both the goals and the planning of every initiative.

The CSIN program, like many others, began with a "heart" to do the right thing. Much of the early influence in design was based on what motivated people—rather than what made good science. (Soon afterwards, however, we understood the need to balance our attention to motivation with care in providing strong and deep science content and pedagogy to all teachers so they in turn could do so for their students.) We began intuitively—believing all along that teachers were and are professionals who make wise choices and want to improve their way of teaching for the good of children. We did not begin with a deficit model. We were not trying to fix what was broken. We were looking for what was—and how to make it more effective, more efficient and more productive for teachers and students.

Instinctively, we knew that professional development had to look holistically at a system—thus, we targeted school-wide change.

Although teacher-by-teacher change is valuable, it simply cannot get the job done in a timely manner. More importantly, current research would underscore that teacher-by-teacher change is less effective for reflection and continuous improvement (Loucks-Horsley et al., 1998). We knew that the professional development program had to include a variety of intensities to meet teachers where they were and move them along a continuum. Our slogan became—there is no "done"! Everything is continuous improvement. We enveloped the notion that everyone had something to contribute and thus became—although the word was not yet in vogue—a community of learners. We just knew we could learn from each other—that no one person had *the* answers. Our job was to pick quality people who had potential, remove their roadblocks and then get out of their way!

We knew enough of McLaughlin's (1993) work on teacher networks to recognize their power for developing teacher competence and confidence in learning and teaching science *and* in providing long term support to change a teacher's belief and practice. And we also knew that we needed to listen to the field. If we were theory only, we would not survive. The movement had to be grounded in reality and responsive to the needs of the field.

Lastly, we valued leadership. We did not give in to "Monday morning science." We believed that building solid, credible leaders was key to implementation, replication, and scale up and so we boldly set our course of developing leaders. Like sailing to that distant shore, sometimes the sailing was smooth and we moved swiftly; other times we tacked for hours, trying to find the wind, and the right strategy. What we learned through the years is to truly value some of our early assumptions, to continue to add to our repertoire—and to never get too full of ourselves! We do hold these "truths" to be self-evident:

Leadership is a people business.

Although our scope of work is in the field of science reform, we believe that leadership involves setting a shared vision and translating that vision into reality. As such, leadership is about change—and the change process (Hord, Rutherford, Huling-Austin, & Hall, 1987) is people first, intervention second. As a network, we built on the strength of people by first honoring them as humans, second celebrating their professionalism as teachers and thirdly prompting their leadership by providing opportunities to stretch in a safe and supportive environment. Nurturing empowers.

Teacher leadership includes understanding science content, teaching and learning and organizational development and design and change theory.

We know that leaders have to be credible in order for people to "buy into" a vision! One area of credibility for science teacher leaders is their science expertise. Teacher leaders need to continually update and deepen their knowledge of science. No one can disagree with this statement but it provides lots of food for thought—how much content is enough for an elementary teacher leader without a science background? How much content is enough for a secondary physics major to teach high school biology? Yet we know that without content background, one can not provide the conceptual framework to challenge teacher understanding and delivery of content to their students.

Another area in which teacher leaders must demonstrate credibility is in understanding the dynamics of teaching and learning. They must be skilled at a variety of instructional strategies that increase student engagement and raise student achievement.

Although credibility in content and teaching and learning is important, a teacher leader in our program *must* go beyond their classroom and sharing their classroom expertise. They must be willing to learn how to help lead the organization. They need to support teacher efforts in the school, teaching and learning leadership in classroom practice, and supporting the leadership of peers. They also need to understand how to work with a variety of stakeholders. In order to do that, the teacher leaders must have knowledge of change principles and organizational design.

Leadership development is embedded in the daily work of the network and the daily work of the teacher leaders. Leadership develops with real work. Leadership capacity is built through performing leadership tasks such as working with planning documents (which include a Program Elements Matrix, Content Matrix, and Profile Instrument, forms created and used in the CSIN2 SSD Training manual developed by K. DiRanna and the Regional Directors from 1972-1977), designing and conducting community meetings, facilitating grade or department meetings, and presenting during institute. In other words, there is real work to be done. Unlike many programs that provide leadership services and ask participants to do "something" back at the home front, CSIN designed an extensive

"on-site" program that lead teaches could adopt, adapt, or re-design to meet the needs of their staff. What they could not do was opt out of providing (with our assistance) between 25-50 hours of professional development for their colleagues.

Leadership has multiple entry points.

This was an unexpected learning! Our first year, we looked for the stars. Although we got some already polished leaders, we had many more dedicated souls who were interested in becoming leaders and willing to take risks. In the early days, we grew rapidly—and did not have time to reflect and build—it was often "sink or swim." And out of this came one of our most important values: Leadership is what you make it—so you get on the moving train and grow with us! We found that helping a hundred budding leaders yields a much larger garden than tending to one prizewinner. Having leaders in a variety of growth stages also indicated to participants that we were learning together. As expected, some of the workshop sessions were uneven and unpolished. But this had an interesting effect on participants. They had a sense that if person X can do Y, then maybe they could also try it. Leadership became contagious.

A Leader By Any Other Name

Readiness for leadership is determined by the individual, their school, and/or their district. The network takes who is sent because we recognize that power is often vested in school/district culture, and leadership, to be successful, must be tied into that power base. What this means in reality is that some participants might not have been selected if the criteria were determined solely by us. And if it was, often we would have been wrong. So our job became working effectively with a wide variety of personalities, knowledge and skill levels. We needed to constantly remind ourselves that leaders come in many sizes and shapes!

Leadership growth is non-linear.

Although we recognize that some believe that one "graduates" into leadership, we firmly believe that one evolves—slowly—*and* with punctuated evolution! Because we believe so strongly in "job embedded" leadership development, we designed programs that provide a variety of opportunities for people to lead. Many begin as a lead teacher representing their schools. They go on to practice their

leadership in a variety of roles, with varying degrees of complexity—including staff developers who work with clusters of schools, cadres who help deliver the science content and regional directors who plan, and implement professional development programs. Many serve on district, regional and state level policy making committees.

Leadership development is a team sport.

Support, support, support! Our view of leadership is not a person on the white horse leading the charge. Instead, we think you can be a "prophet in your own land" if you just get off of the high horse! We view leadership as shared decision making (Fullan & Hargreaves, 1996). As such, we recognize that there is not a "mold" for leadership development. However, we also recognize that several models of leadership development can be analyzed for the effectiveness of a variety of components. Sharing through the network capitalizes on the experiences of others so that the whole is greater than the sum of the parts.

We also believe that resilient organizations are composed of leaders who embrace ambiguity and solve problems in novel ways. One cannot solve problems with the same solutions that made the problem. This requires extensive and intensive communication among colleagues and requires a school to see learning as a journey taken together.

The power of one translates into the power of many.

An organization can take on a life bigger than itself. Increased credibility of the individuals brings increased credibility for the organization and leadership opportunities begin to snowball. In other words, "birds of a feather flock together" and through the "tip-point" strategy, once a strategic mass moves toward a vision, the rest will follow.

Good work begets good work. Often this tip-point is accomplished by leaders who are recognized as credible, believable, and influential. Their words, or presence at meetings and conferences, is respected and listened to. Over the years we have evidence that, like E.F. Hutton, CSIN has been heard! Others began to spout the vision represented by CSIN. Another mechanism for moving the tip-point is following the influence of those who participate in the program, move onto other venues—but take the learning with them. CSIN has been particularly effective in having alumni take decision-making positions as school,

district, and county administrators. A third mechanism for tipping the scales involves people who become familiar with the program through articles and adapt ideas to fit their own. CSIN and some of its strategies were listed in the 1990 California Science Framework, providing our work with a state "stamp of approval" . Many districts used the framework's chapter on implementation, which was written by CSIN, as their guideline for change.

The power of many also has a leadership dimension that involves the formation of partnerships and collaborations. The leadership strength of an organization can be measured by those who want to align with it because of its power—and those who want to squelch it because of its influence! CSIN has been in both positions. Throughout most of its history, organizations like Sandia National labs, urban and local systemic change programs, businesses and universities, have collaborated with CSIN. Recently, as the politics of California have changed, CSIN has become a "force to be dealt with" because of its influence.

Strategies

There is no limit to the strategies that can be used to help people learn. The design framework emphasizes that there are no "effective models" that can be selected and dropped into place—and expected to work regardless of the setting. Instead, each initiative requires a unique combination of strategies in order to address its goals and honor the knowledge and beliefs of its designers.

CSIN's knowledge and beliefs govern the way we think about developing teacher leaders and influence the strategies we use. We think about professional development as a continuous loop. We ground our design in the reality of what is happening in the field and determine how we might adjust to best influence it. This has required us to constantly reflect on our work and extend our strategies, building layers of complexity as we and our clientele become more sophisticated about implementing quality science education programs. We have never, in twelve years, offered the exact same program!

Here is what has proven effective: we have a statewide vision and implementation plan for the program that is similar around the state, with local variations. Although we respect and encourage districts and schools to help us plan professional development, they often are not certain about where to start. So we provide prototypes if they do not know what they need. We know they are developing well when they

take some of our suggestions and revise them completely or even throw them out.

Over the years, CSIN has employed a variety of strategies for building leadership. Lead teachers, typically one per school, attend a 21-day program that addresses content, instructional strategies, and leadership skills. Lead teachers are also responsible for providing between 10 hours (first year leaders) to 50 hours (2+ year leaders) to their staff/district.

The 21-day program for lead teachers is designed during a 10-day leadership academy for staff developers. During this academy, staff developers have opportunities to hear from experts whose writing and thinking expands participants' views of leadership and their roles as leaders. They role play a variety of leadership situations, participate in case discussions about leadership, investigate new topics (e.g., data-driven decision making; facilitator toolkits), and design the 21-day program for the lead teachers. This design process involves selecting and creating the strategies to be used in the program and writing the "manual." The manual documents the thought, discussions, and scenarios that are involved in designing each session. It helps clarify the vision for the lead teacher program, helping staff developers extend their own understanding from their discussions with colleagues. The design of the 21-day program usually incorporates several strategies.

Content is taught by a three-member cadre consisting of a university scientist, high school science teacher, and either a middle school or elementary teacher, depending on the audience. The cadres teach conceptually, linking ideas through questioning strategies. Back home, lead teachers, with assistance from their cadres, help teach content to their school staff on seminar days.

Instructional strategies are presented through participation in lessons that focus on using the learning cycle, examining lesson design and questioning strategies, gathering evidence for student learning, fostering equity in science learning, using multiple measures to assess learning, using peer coaching, and using video cases to analyze teacher decisions.

Content, teaching, and learning are addressed through a collaborative teaching and coaching model that includes planning, teaching, reflecting on student work, altering the teaching plan, teaching the revised lesson, and reflecting again with student work. Regional directors facilitate collaborative teams of four. The

collaborative coaching is continued over six days throughout the school year. The team focuses on using evidence of student learning to guide the lesson design, reflecting, and then redesigning the lesson. The student work is also used as part of professional development on assessment.

Leadership experiences related to organizational design and change theory include work with the Concerns-Based Adoption Model (Hord et al., 1987), dealing with change and resistance, building teams, using the Myers-Briggs (1962) style inventory, adult learning, facilitation skills, and professional development design.

After their 21-day program, lead teachers provide professional development at their school sites, based on the needs of their school staff. They are assisted in design and delivery of these sessions by staff developers and regional directors.

Critical Issues of Leadership Development

The design framework cautions professional developers to pay attention to certain issues or they may undermine the success of their initiatives: the warning is, "ignore them at your peril." Over the years, CSIN has identified several issues that are critical to the network's success. Unlike problems to be solved, these issues are too complex to eliminate, but are in constant need of attention and creative ways to deal with them.

School Culture

Fullan and Hargreaves (1996) talk about the influence of the school culture on its ability to set visions and work toward achieving the vision. They talk about balkanization of faculties where groups practice "one-ups-manship." As the joke says, a consultant is anyone who is at least fifty miles from home. Yet we know that building capacity in schools requires collaboration and shared leadership, so an issue for schools is how to use shared decision making to break the stereotype of not being a prophet in your own land. Can collaborative problem solving encourage teachers and schools to change from self deprecating to self enhancing? Can a school that sees learning as a journey taken together, promote excellence among all staff—enabling each of them to take leadership responsibility for what they care about? Building collaborative cultures that value initiative, expertise, and feedback is a challenging goal for CSIN.

Leadership is politics.

Both "leadership" and "politics" are loaded words, and arenas that many teachers avoid. Yet the reality in education is that everyone wants to tell educators what to do, to spell out their future. The only way to make sure it is a future teachers want, is to take the initiative and plan it themselves! This of course means that teachers and teacher leaders have to look beyond their sphere of influence—beyond their classrooms, and often their schools and districts—and recognize that they have the possibility to influence others.

Backfilling Leadership

Leadership is hard work and it takes its toll—whether due to burn out, new opportunities, fleeting glory, or sharing the limelight. Burnout is a major detractor to maintaining a large pool of teacher leaders. In part, this is by definition—a teacher leader is also in the classroom and so automatically has two full-time jobs—teaching and leading! Even under the best of circumstances, this is exhausting.

Additionally, budding leaders who are good and want to excel can find plenty of work. Unfortunately, they frequently do not know how to prioritize, which relationships to build, or how to say no. They take on too much, worrying about being left out if they do not participate, and prefer to do things themselves. All of these syndromes can contribute to failure.

For successful leaders, new opportunities spring everywhere. And unfortunately, when the leader leaves, the program often collapses. One reason this happens is that there is no organizational thinking that keeps the leadership pipeline open, flowing with new people and new ideas. An organization can stagnate because there is no pathway for leaders to grow. As successful as CSIN has been, there are limitations to its infrastructure. Funding limits the number of full-time positions and thus limits the number of leadership opportunities. Many CSIN leaders have had to take other leadership positions outside this organization. Of course, this ultimately benefits the network, especially when the person assumes a position of authority, often as an administrator, and can still participate in and support the network. CSIN has addressed the issue of limited leadership positions by creating new ones. For example, the staff developer position in the cadres originated as a way to keep talented staff developers in the program, even if their schools had decided to focus on content areas other than science.

Backfilling leadership also means sharing the spotlight, the stage, the fame, and the status. In some cases it means giving up control. There is a personal issue to determining how much mentoring/ nurturing one gives. The question could be: how far can I promote you without losing my own status? It takes a highly mature, competent, and confident leader to transcend this personal concern. Nurturing leadership, building competence and confidence, providing multiple pathways for leadership, and planning for succession are all important issues. This is especially true given the "graying of leadership"—nurturing young, new leaders is a constant challenge for CSIN.

Developing Leaders Among People of Color

Equity at all levels of the education system—from students through the highest levels of leadership—is a particular concern in science and mathematics. Everyone should have equal access to positions of leadership, as long as they can demonstrate the readiness to learn and the willingness to spend the time and effort it takes to do so. Yet, just as there are insufficient teachers of color for our classrooms, so there are even fewer leaders among people of color. CSIN constantly struggles to fulfill its commitment to mirror the diversity in California in its teacher leaders. The network has found some success in using a combination of aggressive recruitment, strong mentoring, and the use of role models. Yet many questions remain, What approaches and styles best welcome people with diverse backgrounds into a community? Is a critical mass of people of color necessary before others are inclined to step forward? and What components can be added to programs to help people learn how to think deeply about issues of diversity and strategies that promote it?

Scaling Up

CSIN has faced the issue of going to scale from its conception, since it filled a gap in the large state of California at the level of schooling with the most schools and teachers: elementary. A statewide program, it has always had a mission of networking hundreds of schools and thousands of teachers, and has succeeded in doing so. Yet issues of working with such large numbers have plagued and continue to plague the network.

Going to scale would never be a problem if we could settle for small-scale changes, but the kinds of transformational changes demanded of inquiry-based science complicate the charge. Yet what

are the best strategies for reaching large numbers of people in substantial ways? We have discovered several. First and foremost, the commitment to broadly distributed leadership means that there are many people committed to reaching many more. Second, equipping those leaders with the skills and knowledge they need, as described above, makes them better able to assist others at the same time that it does two other critical things. The first critical thing is that it makes the teachers aware—sometimes painfully so—of what they do not know. This is especially the case with science content, so limited in a large proportion of elementary teachers. Time and again we have learned that introducing teachers to inquiry-based teaching and helping them look in their and others' classrooms results in a need-to-know, a hunger for understanding of the concepts and principles—the "big ideas"—of science they want their students to learn. CSIN's teacher leaders are major customers of science courses, taking advantage of all opportunities offered to deepen their knowledge of science content. In addition to making teacher leaders aware of their limited content knowledge, CSIN has built a community of experts in a variety of fields that everyone can access. Scientists and teachers from higher grade levels who serve as cadre members are eager and willing to assist teacher leaders. Few teachers alone have the ready and able resources that are part of the CSIN learning community. Going to scale means calling upon all the resources available, and CSIN has worked to make those resources accessible.

Another strategy that CSIN has used to foster change in large numbers of teachers and schools is its commitment to systemic and system-wide change. CSIN does far more than professional development. Choosing strategically to work with the school as a unit, not one-teacher-at-a-time, the commitment has been to work with all components of the school's science program, including curriculum, assessment, organizational structure, and administrative support. All are aligned, that is, are directed at the same set of learning goals for students. Curriculum materials, in particular, are very carefully selected by the school community. These materials must carry much of the responsibility for rigorous science content while teachers are building their own understandings of science. CSIN also works with the district level as much as possible to assist individuals at this level in providing the right kinds of support for schools.

With all of these strategies and perspectives, however, scale-up with quality is always an issue. How do you decide when to stop adding

numbers and go deeper with those already involved? How do you ensure that teachers do not settle for grabbing the superficial features of reform rather than the deeper understanding of strong conceptually rich science teaching and learning? These are the challenges CSIN will always face in a state as large and diverse as California.

Effectiveness

A discussion of CSIN's teacher leadership component cannot conclude without considering the important issue of effectiveness. Hungry for feedback and committed to continuous improvement, we faced early on the need to identify indicators of success. How would we know that we have teacher leaders in a district? What types of evidence help to build a case that capacity has been increased through the development of teacher leaders? Certainly, there are personal transformations where people are empowered to take action. There are also other indicators. We suggest a few that we have looked for and found in CSIN teacher leaders. Teacher leaders

- are self-directed, take action, and make modifications along the way.
- take risks.
- are confident that they can problem solve.
- see opportunity when others feel dismay and discouragement.
- empower other teachers at school and district sites.
- have developed support systems at both district and building levels; support from colleagues, supervisor, community members.
- have respect for their own work and the work of their colleagues.
- feel valued and realize that their contributions are valued; value others and their contributions.

Evidence that CSIN's teacher leadership program contributes to the capacity of classrooms, schools, districts, and the state is found at each and all levels across the state. In closing, we share a vignette of how one school district built its capacity for initial and ongoing improvement of its science program, with help and support by CSIN's teacher leaders. This vignette underscores the importance of leadership that is simultaneously "top down" and "bottom-up."

The Mountainside District Story

Teacher leadership begins in two places. At the "grassroots," classroom teachers begin to see that leadership needs to come from within and are willing to take the initiative to be part of the change process. The other place teacher leadership starts is with forward thinking (innovative) administrators who recognize that building internal leadership capacity strengthens the district/school in many ways. Both places are a natural match with the CSIN philosophy: "Teachers should be empowered to become leaders within the district."

As an example, the K-12 Mountainside District found itself in need of professional development for staff members in the area of science, based upon recent statewide recommendations for changes (in this case new Science Standards (National Research Council, 1996)) and subsequent student assessment. The district had no capacity to offer such professional development at the time. So the superintendent took steps to find professional development opportunities to prepare teacher leaders.

The district held a series of community meetings during which the recommended state changes were introduced to teachers, parents, and interested community members. Through small facilitated breakout groups, participants were asked for "pluses" and "wishes:" what the district was already doing well in science (pluses) and what the community would like to see it do (wishes) to meet the new state recommended changes and improve the science program in the district. Input from these sessions served as a starting place for teams assembled from volunteers from both the education community and the community at large who were charged with developing strategies and plans for addressing each of the wishes that had been identified.

As this process of system change in the district began, the district became aware of CSIN, which promised to help them build teacher leadership to strengthen pedagogy and content understanding and improve student outcomes. The program would build internal capacity to support change by providing professional development to district teachers and giving them particular tasks to do at their schools that related to the district goals. When the district invited teachers to apply, Sarah, an innovative fifth grade teacher at Harrison School did so. The first year, she was one of few teachers from her district who participated. The second year, her hard work and success in

implementing what she had learned was recognized when half of the district schools enrolled teachers in the program and Sarah moved into a leadership role, helping schools do what she had done in year one.

With Sarah's leadership and the professional development attended by the classroom teachers, they set out to design learning opportunities in science for all of the district's teachers. These lead teachers designed the science offerings for the district inservice day and were subsequently asked to provide ongoing, half-day professional development for one content strand of the district's science content matrix. The district supported the scientist to deliver the content and purchased supplies, handouts, and curriculum materials.

Today, the district's participation in what is now the K-12 Alliance has expanded from elementary teachers to include teachers at all levels. The original teacher leaders are the backbone of all staff development occurring in the Mountainside School District. Science staff development is ongoing and now includes workshops on facilitated learning, assessment, and inquiry. The leadership that began in science has transferred to other departments within the district. Language arts, mathematics, and social science committees are now guided by teacher leaders who were prepared for their roles through the K-12 Alliance. Sarah is the district curriculum coordinator and change is evident throughout district schools and in the classrooms.

Conclusions

This is just one of hundreds of stories—each unique—of the influence of teacher leaders in California schools that have been part of CSIN, and now the K-12 Alliance. Their stories are not always of glowing success, all have experienced "bumps" in their journey. But the large number of successes that have occurred rest on the combination of effort to build new knowledge and skills, support from committed administrators and communities, and belief that leadership must lie in a teaching force strongly committed to the growth of students and fellow professionals.

References

Bybee, R.W. (1993). *Reforming science education: Social perspectives and personal reflections.* New York: Teachers College Press.

Fullan, M.G. (1991) *The new meaning of educational change.* New York: Teachers College Press.

Fullan, M.G., & Hargreaves, A. (1996). *What's worth fighting for in Your school?* New York: Teachers College Press.

Harvey, T. and Drolet, B. (1994) *Building teams, building people: Expanding the fifth resource*. Lancaster, PA: Technomic Publishing Co., Inc.

Hord, S.M., Rutherford, W.L., Huling-Austin, L., & Hall, G.E. (1987). *Taking charge of change*. Alexandria, VA: Association for Supervision and Curriculum Development.

Loucks-Horsley, S., Hewson, P.W., Love, N., & Stiles, K.E. (1998). *Designing professional development for teachers of science and mathematics*. Thousand Oaks, CA: Corwin Press.

McClelland, D. (1970). The two faces of power. *Journal of International Affairs. 24*, No. 1, pp. 29-47.

McLaughlin, M.W. (1993). What matters most in teachers' workplace context? In J.W. Little & M.W. McLaughlin (Eds.), *Teachers' work: Individuals, colleagues, and contexts* (pp. 79-103). New York: Teachers College Press.

Mundry, S., & Loucks-Horsley, S. (April, 1999) Designing professional development for science and mathematics teachers: Decision points and dilemmas. *NISE Brief*, 3(1), 1-7. Madison, WI: National Institute for Science Education.

Myers, I.B. (1962). *The Myers-Briggs Type Indicator*. Palo Alto, CA: Consulting Psychologist Press.

National Research Council. (1996). *National Science Education Standards*. Washington, DC: National Academy Press.

Senge, P.M. (Fall, 1990). The leaders' new work: Building learning organizations. *Sloan Management Review*. Cambridge, MA: Sloan School of Management, Massachusetts Institute of Technology.

Weisglass, J. (1994). *A call for educational change leadership*. UC Santa Barbara: Center for Change in Mathematics and Science (CECIMS).

BEST COPY AVAILABLE